ENABLING THE DIGITAL MANUFACTURING REVOLUTION
– everything you need for a complete end-to-end digital manufacturing platform.
Ever-increasing product complexity, ever-shorter times to market and the latest technologies are driving a manufacturing revolution. Are you ready?

"When you use automation you can enhance productivity and when you have a machine doing that task you can focus your work force on higher value work."

Matt Rendall, CEO & Co-Founder, OTTO Motors

Dell Technologies x OTTO Motors – Making Robots a Reality
See how OTTO Motors and Dell Technologies are creating robots that map their environment and move independently to enhance productivity.
TRANSFORMING DIGITAL MANUFACTURING

Joined-up, pre-integrated, optimised and validated – welcome to the Dell EMC end-to-end infrastructure platform for digital manufacturing.

Harness the latest workstation, HPC and storage capabilities

Dell EMC technology for Digital Manufacturing harnesses the workstation, HPC and storage capabilities that combine to enable better products, more efficient design and production processes, and meet rapidly changing customer preferences.

Collecting, collating and digesting more and more data in the entire ecosystem, from product modelling to after-sales trends, are making the digital factory a powerful and necessary reality in the manufacturing landscape.

The Dell EMC infrastructure for digital manufacturing

1. Your computing performance is just too slow
   - Analysis-led workflows and shorter development times demand ever greater performance.

2. Workload demands are swamping your resources
   - Virtual prototyping and simulation demands are overtaking your computing solutions.

3. You need the flexibility to scale-up
   - Workload demands are swamping your resources.

4. You risk losing design and development talent
   - Increasing pressure on resources is affecting workflows, maintenance and productivity.

5. Data integrity and security is becoming a problem
   - Outdated IT and processes are making it hard to attract and retain the expertise you need.

   - To be more efficient, you need to share design intellectual property, increasing the risk of data loss.

Design

Virtual prototyping

Data Analytics

Workstations

HPC Cluster

Scale out storage and accelerator optimized platforms

ProSupport Plus
Welcome to design visualisation in the VR/AR age.

Meeting the challenge of industry transformation.

Have a question? Arrange a call with one of our experts.

The manufacturing sector is changing dramatically, but still driven by two key factors: time-to-market and shorter development cycles, putting designers and engineers under increasing pressure. However, the tools available are also developing rapidly.

- Connected devices access and integrate information into the design process from an expanding range of sources, including the IoT
- Data analysis helps to deliver both better products and better feedback
- Allied technology developments enable tighter integration between the design, engineering and manufacturing processes, and allow built-in lifecycle management
- 3D technology enables detailed visualisations of how the final product will appear, plus simulations of product performance under real world conditions
- Virtual Reality (VR) and Augmented Reality (AR) are changing the way designers, manufacturers and customers engage with products, enabling inspection of parts, components or finished items as if they were right there in front of you.

Dell Precision workstations are designed and built to enable the transition to the new ways of working, capable of delivering the operational advantages, mobile flexibility, big data analytics and VR/AR technologies that optimise design, production and manufacturing workflows.

Learn more ›
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Meeting the challenge of industry transformation.
Despite all the hype around consumer-focused Virtual Reality over the last few years, for the design and engineering sector VR solutions have been available for decades. However, consumer-driven developments are resulting in significant shifts in focus and cost, with motion-tracking technology and headsets from manufacturers like HTC and Oculus lowering the cost of entry for design and manufacturing professionals.

The possibilities are exciting, offering the ability to inspect a product in real time from all angles – and overlay variable simulations – enabling designers and manufacturers to avoid the costs associated with physical models and accelerate time-to-market.

Another, associated, development is Augmented Reality (AR). While VR allows users to immerse in an entirely virtual world, AR allows work to be conducted in the context of the real world, enabling designers to evaluate and interact with a full-scale prototype in a real world setting.

Dell Precision workstations optimise visualisation workflows and enable VR and AR solutions for engineering and manufacturing, with VR-ready hardware and ISV-certified applications.

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**Introducing Workstation Virtualisation Centres of Excellence**

The Dell EMC approach enables organisations to deploy virtual reality and experiential visualisation by de-risking the process and by providing access to VR Centres of Excellence, contained within Dell EMC Solution Centres around the world, which allow customers to architect and build real-world virtual solutions and run them in their own simulated environments for proof-of-concept validation prior to deployment. They provide remote access capabilities for customers, channel partners and independent software vendors (ISVs):

- Limerick and Cork, Ireland
- Santa Clara and Austin, USA
- Paris, France
- Frankfurt, Germany
- Dubai, UAE

Learn More ›
EXPLORE THE POTENTIAL.

The possibilities for VR and AR usage in engineering and manufacturing are almost endless, offering new ways of working and driving innovation by opening up new perspectives across a huge range of areas.

Product design
- The ability to view CAD models from any angle accelerates design workflow and enhances design understanding.
- Remote viewing reduces travel time and costs and speeds up the process.
- Interactive space planning enables equipment, components and assembly lines to be adjusted before anything is actually built.
- Different perspectives reveal the effects of material and lighting changes and AR enables physical prototypes to be overlaid at scale, with design iterations, additional materials, options and schematics.

Visualisation
- Virtual showrooms enhance the retail experience and aid purchase decisions, enabling realistic configurations and options without physical products.
- Intuitive spatial understanding aids facility planning and virtual construction, while detailed simulations allow product and component inspections in ways that are not possible in real life.

Collaboration
- Concepts and designs can be shared for approval and design reviews, providing realistic representations (i.e. walk-throughs) of products.
- Design issues can be resolved more quickly in a common immersive environment.

Training
- Workers can be trained for complicated tasks in realistic environments for more cost-effective, more efficient and less hazardous training.

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- Storage

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Arrange a call with one of our experts.
HPC – POWERING THE NEXT INDUSTRIAL REVOLUTION

Dell EMC Ready Bundle for HPC Digital Manufacturing bridges the technology gap between workstations and full-scale HPC clusters/data centres

A single, easy-to-manage solution to fit your specific manufacturing requirements

The approach enables you to design a highly flexible and scalable HPC cluster to meet your manufacturing needs exactly, with a Dell EMC Ready Bundle for HPC Digital Manufacturing, which comprises four building blocks:

1. Basic – the ideal stepping stone from Windows workstation usage to a full Linux-based HPC cluster environment, providing organisations with a modest cluster to improve single job capacity and overall volume of jobs. More

2. Explicit Solver – to run simulation types such as crash, stamping, safety, impact analysis, fluid flow, pump design, combustion, aerodynamics and acoustics. More

3. Implicit Solver – to run simulations such as noise vibration harshness (NVH), structural integrity (linear and nonlinear), assembly. More

4. Management – the Dell EMC Ready Bundle for HPC Digital Manufacturing is configured to work with all industry-leading IPMI-based cluster management tools and can include Dell-supported Remote Cluster Management Services if required. More

Dell EMC provides a complete ecosystem of HPC systems and solutions designed to address the unique workflow requirements of digital manufacturing including:

- Virtual prototyping – for faster prototypes and testing
- Virtual manufacturing – for improved time to market and reduced tooling costs
- Product lifecycle management – for service and warranty projections, engineering change orders and simulation of physical objects, from product inception to end-of-life

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Dell EMC Ready Bundle for HPC Digital Manufacturing bridges the technology gap between workstations and full-scale HPC clusters/data centres.

A single, easy-to-manage solution to fit your specific manufacturing requirements

The Dell EMC building-block approach enables organisations to more easily adopt HPC solutions as part of their digital manufacturing infrastructure by removing many of the technical, resource and cost hurdles.

Basic – the ideal stepping stone from Windows workstation usage to a full Linux-based HPC cluster environment, providing organisations with a modest cluster to improve single job capacity and overall volume of jobs.

**BASIC BUILDING BLOCKS**

**Typical use**
- Windows based customers looking for a modest cluster to improve single job capacity and overall volume of jobs
- Stepping stone from Windows workstation usage to full Linux based HPC cluster environment

**Typical simulation types**
- Crash, stamping, safety, impact analysis, fluid flow, pump design, combustion, aerodynamics, acoustics

**Typical run environment**
- SMP parallel jobs on a single node and MPI parallel jobs run across two node 10GE switchless “couplet”

**Reference Architecture**
- PowerEdge R640
- Intel Xeon Gold 6142 (32 cores per server / 64 cores per couplet)
- 192GB 2667MHz DDR4 memory
- 2x400GB Mixed-use SATA SSDs

Management – the Dell EMC Ready Bundle for HPC Digital Manufacturing is configured to work with all industry-leading IPMI-based cluster management tools and can include Dell-supported Remote Cluster Management Services if required.

Design and architect your own Dell EMC Ready Bundle for Virtualisation all tested and validated for interoperability, optimised performance and maximum stability.

Have a question? Request a call with one of our experts.
EXPLICIT SOLVER BUILDING BLOCKS

Typical ISV application workloads
- CFD: Fluent, CFX, STAR-CD, STAR-CCM+, OpenFOAM, PowerFLOW
- Explicit Structures: Abaqus-Explicit, LS-DYNA, PAM-CRASH, Altair-RADIOSS

Typical simulation types
- Crash, stamping, safety, impact analysis, fluid flow, pump design, combustion, aerodynamics, acoustics

Typical run environment
- MPI parallel jobs run across 4-12 nodes
  - Typically run on a cluster with a high-speed IB, OPA, or 10GE network
  - Minimal I/O to local disks during job

Reference Architecture
- PowerEdge C6420
- Intel Xeon Gold 6142 (32 cores per server)
- 192GB 2667MHz DDR4 memory
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Implicit Solver Building Blocks

Typical ISV application workloads
• ANSYS-Mechanical, Abaqus-Standard, MSC. Nastran, NX.Nastran, Altair-Optistruct

Typical simulation types
• Noise vibration harshness (NVH), structural integrity (linear and nonlinear), assembly

Typical run environment
• Most jobs run on a single node
• Jobs tend to require large memory to improve overall performance
• Scratch I/O to array of local disks typically preferred over shared file system

Reference Architecture
• PowerEdge R640
• Intel Xeon Gold 6134 (24 cores per server)
• 384GB 2667MHz DDR4 Memory
• 4x400GB Mixed-use SATA SSDs

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More »
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**Management Building Blocks**

**Management software**
- Bright Cluster Management (optional) The Dell EMC HPC System for Manufacturing is configured to work with all industry leading IPMI based cluster management tools — optimized for Dell specific hardware
- Dell-supported Remote Cluster Management Services (optional)

**Management Server building blocks**
- Cluster management — Typically one for modest clusters, two for larger clusters
- Cluster administration (queues, etc.) — Typically one-two for each specific task
- Login — Typically one for each 30-100 users

**Reference Architecture**
- PowerEdge R640
- Intel Xeon Bronze 3106 (16 cores per server)
- 192GB 2667MHz DDR4 memory
- 1 x 800GB Mixed-used SATA SSD
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A Dell EMC Ready Bundle for HPC Digital Manufacturing helps to bridge the gap between better products, more efficient design and production processes and rapidly changing customer preferences. Enabling the collection, collation, and digesting of more and more data across the entire ecosystem, from modelling to after-sales trends, allows manufacturers to implement new products or production lines in a speedy and cost-effective manner and to embrace a new wave of developments, including:

- **Virtual prototyping** – allowing engineers to validate designs with a high degree of accuracy and improve designs by leveraging machine learning and data analytics.

- **Cyber-Physical Systems (CPS)** – CPS integrates physical and software components to give a more holistic overview of what happens in the production process, allowing different components of the system to interact differently, even via Machine-to-Machine (M2M) communication.

- **Machine Learning** – bringing greater predictive accuracy to every phase of the production process, machine learning can improve yield rates and continuously improve preventative and Maintenance, Repair, and Overhaul (MRO) performance.

- **Virtualization** – central to Dell EMC manufacturing solutions, virtualization enables manufacturers to avoid the extremely high cost of setting up pilot plants or testing new production facilities.

- **Big Data and advanced analytics** – analysing historical data can help to identify patterns and provide insights to optimise production processes. As advanced analytics become available to more employees, an ever-increasing abundance of real-time shop-floor data and effective statistical modelling is reducing the need for custom reporting by data scientists.

Have a question? Arrange a call with one of our experts.

See how Siemens helps electronic device manufacturers to get the big picture in seconds ›
A CLOSER LOOK – DELL CUSTOMER CASE

ELECTRONIC DEVICES MANUFACTURERS SEE THE BIG PICTURE IN SECONDS

1 The situation: Siemens PLM Software helps manufacturers of electronic devices and other products to gain a 360-degree view of their supply chains, thanks to their Omneo big data analytics solution.

2 The challenge: The company was looking for the right software and hardware infrastructure partners in order to support the collection and analysis of booming amounts of diverse data types. Manufacturers rely on Omneo to identify risks to product quality.

3 The solution: Siemens PLM Software worked with Dell and Cloudera to build a software solution on top of the Cloudera Distribution of Hadoop Big Data solution, running on a cluster of Dell PowerEdge C8220 servers, thus giving customers total product visibility throughout their entire supply chains.

4 The result: Manufacturing customers of Siemens PLM Software can now search billions of records in seconds. The infrastructure can scale to support 1 billion new records every month. By transforming Big Data into actionable intelligence, Omneo helps customers to identify and resolve supply chain and product performance issues before they negatively affect customers or sales. It is estimated that the solution saves millions of dollars and boosts productivity while improving the customer experience.
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FOR MANUFACTURING, THE FOURTH INDUSTRIAL REVOLUTION IS HERE, WITH AI AT ITS CORE.

Dell EMC Isilon – the storage and analytics platform that enables the revolution.

In manufacturing, the fourth industrial revolution is based on how technology is intimately connecting products, smart factories and supply chains, with HPC and artificial intelligence (AI) technologies providing a key driving force.

Now, the Dell EMC Isilon portfolio of storage solutions enables manufacturers to use the massive amounts of data being collected for predictive analytics from industrial sensors and devices (Industrial IoT), and delivers radical new ways of automating production, designing and even ‘printing’ products using AI and Deep Learning (DL) enabled technologies.

Product design

In product design, new ‘generative’ design solutions allow designers to come up with dozens – or even hundreds – of different options based on algorithms generated by the wealth of data available. And in industrial product design, DL is being used to reduce the time spent in finding parts for redesign, with CAD software platforms that search based on deep learning image recognition techniques. DL is also used in monitoring streaming data from sensors in the field – how a machine or product is being used in the real world can influence design improvements and help to predict failure and maintenance issues.

Managing manufacturing workflows – not storage

With AI and DL playing increasingly important roles in digital manufacturing, having a storage architecture that works seamlessly with your design and simulation workflows is absolutely critical. That’s where Dell EMC Isilon comes in, completing our end-to-end solution that can transform your digital manufacturing.

Isilon scale-out NAS turns managing petabytes of manufacturing data into a ‘part-time job’, enabling consolidation of divisions, project and design teams and entire manufacturing workflows into a unified storage solution that reduces costs and improves operational efficiency. It also enables consolidation of large-scale file and unstructured data assets in an accessible ‘data lake’, eliminating siloed islands of storage across the enterprise.

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See how the Isilon Data Lake works ›
MULTI-PROTOCOL SUPPORT FOR THE MANUFACTURING DATA LAKE

With Isilon, you can streamline your manufacturing and non-manufacturing storage infrastructure by consolidating large-scale file and unstructured data assets, eliminating islands of storage across the enterprise. Isilon scale-out NAS includes integrated support for a wide range of industry-standard protocols, including Internet Protocols IPv4, and IPv6, NFS, SMB, HTTP, FTP as well as a REST API for file access via HTTP for your cloud initiatives – including IoT.
SCALE-OUT FLEXIBILITY,
FROM DESIGN AND
DEVELOPMENT TO THE
FACTORY FLOOR


In manufacturing, predicting storage needs can be difficult. The Isilon scale-out network attached architecture lets you start small with the storage you need today – a single Isilon cluster can start with as little as 96TB – and scale easily to PB levels. Storage nodes can be added to a cluster as required in seconds, with no downtime.

Offering a choice of all-flash, hybrid or archive systems, Dell EMC Isilon Big Data storage and analytics solutions combine a powerful, simple, massively scalable platform with integrated support for Hadoop analytics, allowing you to quickly implement data analytics capabilities without unnecessary capital expenditure, increased operating costs and time-consuming replication of data on a separate infrastructure.

Large-scale data capacity and performance for digital manufacturing applications
With a choice of all-flash, hybrid or archive systems, the new generation Isilon enables a policy-driven, automated tiering solution that increases performance, efficiency and flexibility.

Take on more projects, develop more ideas faster and serve-up more data
New generation Dell EMC Isilon storage accelerates outcomes, with 9x more IOPS and 18x more throughput than the closest competitor.

See how the new generation Dell EMC Isilon hardware platform and ground-breaking all-flash Isilon storage can deliver your competitive edge.

ENABLING ACCELERATED ANALYTICS, ARTIFICIAL INTELLIGENCE AND DEEP LEARNING
In smart factories, everything from the supply chain to asset management and robotics inside the plant is being influenced by accelerated analytics, AI and DL.

Have a question? Arrange a call with one of our experts.

Learn more about how INTEL-POWERED AI HELPS PREVENT MANUFACTURING ERRORS.
Arrange a call with our experts

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Dell Financial Services can deliver the means to transform your organisation and the way you work, to improve productivity, accelerate growth and build competitive edge. The wealth of leasing and financing options available can help with managing capital expenditure, operating expenditure and cash flow, as well as providing a wide range of payment options that make it easier than ever to meet your needs, including PCaaS.
At Dell EMC we have a reputation for innovation in customer and system support services, from reactive support for troubleshooting and maintenance to proactive infrastructure monitoring and predictive system analysis, training and deployment services.

The services portfolio for digital manufacturing includes:

- **The Dell EMC Big Data Vision Workshop** – defines how big data and analytics can transform your business, leveraging a proven methodology to envision, identify and prioritise opportunities and provide a roadmap. More ›

- **Dell EMC ProDeploy** – expertise and best practice in implementing Dell EMC machine learning and deep learning solutions. More ›

- **Dell EMC ProSupport** – a single point of accountability from experts with solution-specific training, along with premium hardware and software support available 24x7. More ›

- **PC as a Service (PCaaS)** – Optimizing the PC lifecycle for IT management. PCaaS combines hardware, software and lifecycle services into a single, predictable price per seat month. More ›

- **Dell EMC Professional Services on Dell.com** – deliver proper deployment that configures each server, network and storage component correctly, saving time and resources. More ›

- **IT Lifecycle Services** – Accelerate technology adoption with expert deployment and maximize productivity with experienced support, backed by proactive, predictive digital tools. More ›

- **Dell EMC Remote HPC Cluster Management** – keeps the solution running smoothly with proactive monitoring and management of the entire solution. More ›
Data-driven, smart technologies are transforming manufacturing processes, enabling product designers and manufacturers to evolve into agile, connected enterprises that use the latest design tools and information analytics to produce the innovative, high quality components and products that businesses and consumers want. In close partnership with Dell EMC, Intel is at the heart of the transformation, reinventing manufacturing for the digital age and providing powerful performance technologies across the Industry 4.0 manufacturing landscape.
Intel®

— PERFORMANCE ACCELERATION, FROM WORKSTATION TO DATA CENTRE.

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Intel® Xeon® Scalable Platform

Delivering consistent, pervasive breakthrough performance, the Intel® Xeon® Scalable Platform provides a foundation for a powerful data centre infrastructure that creates an evolutionary leap in agility and scalability. The processor sets a new level of platform convergence and capabilities across compute, storage, memory, network and security.

- An ideal foundation for highly parallel applications in manufacturing design, such as machine learning training, simulation and visualisation.
- Reduces TCO by up to 65%, with lower software and OS licensing fees and reduced acquisition, maintenance and infrastructure costs.
- Enables 4.2x more VMs per server compared to earlier generations, allowing consolidation of more services on less hardware.
- Delivers higher per-core performance, with up to 28 cores, delivering high performance and scalability for compute-intensive workloads across compute, storage, and network usages.
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Intel® Xeon® Scalable Processors and W Processors

Intel® Xeon® scalable processors and W processors deliver ultimate workstation performance for the next generation of product designers, enabling them to create, test and deliver solutions faster than ever. Providing the ideal combination of processor power, memory and Intel® OptaneTM storage, the processors run complex applications effortlessly, increase productivity and enable 3D design and VR capabilities.

- Error Correction Code (ECC) circuitry built into workstations powered by Intel® Xeon® processors tests for and corrects errors in data as it passes in and out of memory.
- Up to 28 cores and 56 threads per processor for Intel® Xeon® Scalable processors and up to 18 cores and 36 threads for Intel® Xeon® W processors deliver high performance and scalability for compute-intensive workstation workloads.
- Delivers expanded I/O with 48 lanes of PCIe 3.0 bandwidth and throughput for demanding I/O-intensive workloads.
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Intel® Optane™

Intel® Optane™ SSDs and data centre solutions deliver a breakthrough in non-volatile memory technology, enabling memory-like performance at storage-like capacity and cost. This transformative technology provides an unparalleled combination of low-latency, high throughput, high service quality and endurance.

- Delivers a unique combination of 3D XPoint memory media, Intel® Memory and Storage Controllers, Intel Interconnect IP and Intel software.
- Decreases latency and accelerates systems dealing with workloads that demand large capacity and fast storage.
- Optane SSDs set the standard for high performance workstations and Optane data centre solutions accelerate applications for fast caching and storage, reduce transaction costs for latency-sensitive workloads and increase scale per server.
Intel® CAS

Intel® Cache Acceleration Software (CAS) operates with the server to create a multi-level cache that optimises the usage of system memory and automatically determines the optimum cache level for active data. CAS enables data centre systems to perform to their full potential without having to increase storage, server or memory capacities and without adding huge expense and complexity.

- Intelligently analyses data to ensure that everything is where it should be, based on workload.
- Prioritises active ‘hot’ data on super-fast SSDs and keeps the ‘cold’ data where it is cost-effective.
- Allows applications to perform even faster than when running fully on flash/SSDs.
- Delivers faster throughput, lower latency and reduced recovery times.

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